

Getting Rid of Human Personnel in Lockdown Enforcement

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Abstract

In this paper, we aim to look at the problem of detecting and identifying people who break lockdown during the Coronavirus outbreak, without the need of policemen on the road to check and monitor each person. This is a major issue as many policemen themselves are getting infected by the disease and are dying over the world. We propose a novel software system, that uses remotely controlled drones and robotic cars, to patrol the roads and collect videos, from which, people and vehicles are identified. If the person is breaking the lockdown rules without any reason, then the police can track his position (either by using the RFID card, or by the video footages) and then arrest/fine him.

1. Introduction

The COVID 19 (COrona VIRus Disease) pandemic is the defining global health crisis in 2020. It is caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) [34]. The virus spreads rapidly, and outbreaks is growing at an exponential rate. According to data from countries affected early in the pandemic, about 40% of cases will experience mild disease, 40% will experience moderate disease including pneumonia, 15% of cases will experience severe disease, and 5% of cases will have critical disease and can die, if no proper healthcare is provided.

The outbreak was identified in Wuhan, China, in December 2019. [33]. and as per 28th April 2020, more than 3 million people have been infected by this virus worldwide, and over 211,537 have died because of this. Statistics show at least 2 million active cases, of which more than 3% is critical and require ICU and ventilators. Hospitals in most of the country do not have adequate required health care facilities to admit those many patients. There is no cure yet, for this virus. Under these circumstances, in order to successfully slow down the transmission and to protect the health care system, it is essential to accurately diagnose and effectively isolate and care for all cases of COVID-19 including cases with mild or moderate disease. However, with a small

percent of the population being asymptomatic with the disease, it is necessary for everyone, including those who are perfectly healthy, to practice social distancing.

Countries are racing to slow the spread of the virus by testing and treating patients, limiting travel, quarantining citizens, maintaining social distance and cancelling social gatherings. To suppress community transmission, many countries worldwide has imposed lockdown in one way or the other with restaurants and bars, shops, schools and gyms closed, and citizens required, or at least strongly encouraged, to stay home to avoid catching or spreading COVID-19, the respiratory illness caused by the novel coronavirus.

At present, there are no therapeutics or vaccines proven to treat or prevent COVID 19, and national governments, WHO and partners are working urgently to coordinate the rapid development of medical countermeasures. It usually takes years to develop a new drug treatment or vaccine, but even in a best-case scenario, these are likely to be 12-18 months away. More than 140 experimental drug treatments and vaccines for the coronavirus are in development worldwide, most in early stages, including 11 already in clinical trials, according to Informa Pharma Intelligence. [6] Vaccines to prevent infections and drugs to treat them can't come soon enough.

Without a proper cure, health authorities have to rely on containment measures such as travel bans, quarantines and social distancing to limit the community spread of the disease. Until a vaccine is developed, extreme social distancing is pretty much the only intervention to help individuals stay healthy and to break the chain of transmission, and thus giving more vulnerable population a fighting chance of surviving this pandemic.

India has been put under a complete lockdown since March 24, effectively quarantining its 1.3billion citizens, in order to alleviate the virus. Residents are ordered to stay home. Other than a few essential services, all commercial, industrial, religious and cultural activity is shut down. India also shut down most of its international and domestic transport services. Most of the state borders are completely closed. However the country's number of cases continues

to climb, with around 28,000 cases and 886 deaths(28th April 2020), indicating that the lockdown measures are still not implemented properly. Though people have been given strict orders to stay at home and not go out anywhere, unless for essential groceries or immediate healthcare, they still break the lockdown rules and gather around and roam in public spaces thus spreading the virus.

To enforce these rules more efficiently, many states worldwide, including India, have deployed police forces. The police are trying their level best: policemen have been stationed at multiple check posts day and night. In some places, they patrol and conduct random checks, to ensure the lockdown. Refusal to comply by directions given by the Centre or the respective state can result in punishment which includes jail term of upto 1 year or a fine or both. [27]. As many as 568 people have been arrested in Badaun, Uttar Pradesh for reportedly violating the nationwide lockdown to curb the spread of coronavirus, police said on Saturday, adding a fine of Rs 13 lakh was collected from the offenders.(April 11) [29]

But the curfew has put authorities themselves under extraordinary pressure, given India's poor police personnel-population ratio of around 144 to 100,000 citizens [10], as opposed to the UN recommendation of 222. Indian police tend to be overworked. A national survey in 2014 found that 90% of officers worked longer than eight hours a day, and 73% got no more than one day off per week. Most importantly, they are poorly trained. All this explains their lack of patience in dealing with the public.

The country used heavy-handed force to enforce these rules. Instead of helping distraught citizens cope with these frustrating and hungry times, many Indian police personnel are increasingly caught harassing and assaulting them. Numerous instances were reported of police personnel assaulting and, in some cases, even opening fire at people breaking the lockdown rules. (Bangalore: Mar 26, 2020) [2]

There has also been reports of people discriminating medical personnel and airline crews as they might transmit the virus. Several healthcare workers in India have been attacked as they battle to stop the spread of the coronavirus. [14] Meanwhile, a hospital in the northern city of Ghaziabad also witnessed unruly scenes on Thursday, where some of the quarantined attendees of the Tablighi Jamaat gathering in Delhi, allegedly used abusive and vulgar language against members of staff. A doctor who was treating coronavirus patients is Hyderabad's Gandhi Hospital was also attacked. Footage has emerged of an Indian policeman's hand being lopped off in a terrifying sword attack as officers stood at a coronavirus road checkpoint. [12].

Therefore, there is a great risk for both policemen and health care officials from the society, as they try to contain the virus. A head constable with Mumbai police, Chandrakant Ganapat Pendurkar, succumbed to coron-

avirus(April 25, 2020) , while over 96 policemen including officers are infected with coronavirus in Maharashtra. [25] Everyone, including the police, would like to stay at home, so that they do not get infected. Hence there is a need for a way to catch the lockdown breakers and penalize them, with the policemen at home.

This paper discusses the following ways by which the law officials can remotely catch hold of the people breaking these laws and penalise them:

1. Using drones for monitoring cities and towns and use advanced face recognition techniques to find the identity of the person and penalize them
2. Using the already existing CCTV surveillance cameras to try to identify places where people crowd together

In the end, we discuss an approach that is a combination of the existing surveillance methods or a remote controlled or automated self driving cars and a RFID card technique, that would efficiently be able to identify the law breakers (even with their masks on) and penalize them accordingly.

2. Literature Review

A lot of research has been done recently into methods of tracking people. From facial recognition to phone tracking, governments are turning to technology to trace infections as they enforce lockdowns, curfews and quarantines.

There are different tracking and surveillance mechanisms to detect lockdown violators in various parts of the world:

2.1. Using tracking wristbands

This surveillance method aims to use some wearable device (like a wristband) that can track people during the lockdown. [15]. This method has been implemented worldwide:

- Belgium: Here residents are testing a social distancing wristband that vibrates if it comes within 3m (9.8ft) of another band. The only thing the wearer has to do is to step back to ensure he is in a safe distance. [1]. However this has no tracking facilities, and is just a way to ensure social distancing at a personal level. If everyone in the community wears this band, then there would be perfect social distancing even without the police interfering in the matter. However, the only issue is that it is expensive. Making such bands for over 1.35 billion people would cost a huge amount of money. Hence it is impractical, at least in India.
- Hong Kong: Here, those in quarantine are given special wristbands, that can track the location of the wearers. Here the police can be alerted if people wearing this band leave the house while under quarantine.

- South Korea: Here, those found to be violating quarantine rules are ordered to wear a tracking band, that alerts the authorities if the wearer leaves home or tries to remove the device.
- India: India has announced plans to manufacture thousands of location and temperature-monitoring bands for people in quarantine. However, as mentioned above, it is impractical to manufacture these bands for the whole population.

The main issue of this method is the cost involved. Making over 100 million (10% of the population) of such bands can be very costly. (For example, 200 electronic ankle bracelets with GPS tracking capability costed over \$3 million, in Western Australia. [16])

Another issue is the security and privacy of data. When the pandemic is over, all these bands must be put to an end. Care should be taken so that the location data does not fall in dangerous hands. India's upcoming data privacy law is also under discussion, so there are no safeguards related to data protection at the moment. Also, there are multiple cases of data leakage and misuse during these times, over the social media. [18, 31]

2.2. Surveillance camera system with face recognition (CCTV)

Facial recognition software can identify individuals in photos and videos based on a database of known subjects.

China has a large surveillance network. According to a report from Reuters [20], the Chinese surveillance network was able to track out a person from Hangzhou as he came home from a business trip in a nearby city, Wenzhou, using his car's license plate, and ordered the person for a 28 days self-quarantine. When he broke the quarantine rules, the police were able to trace him: he had been spotted near Hangzhou's West Lake by a camera with facial recognition technology, despite of him wearing a mask. It was thought that the face masks, many are wearing as part of protective measures may hinder the facial recognition technology. However, a company in China has outlined that the technology exists to identify people who are even wearing masks. Hanwang Technology, also known as Hanvon, has said that a research team of 20 staff was able to come up with the solution, using a sample database of about six million unmasked faces and a smaller database of faces that were masked.

Hanwang is now selling two main kinds of products that use the new technology. One performs "single channel" recognition, which is designed to be used at the entrances to buildings. The other product is a "multi-channel" recognition system that uses groups of surveillance cameras. Hanwang's vice president, Huang Lei, told Reuters that the multi-channel system can identify individuals in a crowd of

up to 30 people "within a second." "When wearing a mask, the recognition rate can reach about 95%, which can ensure that most people can be identified," Huang said. He added that the system's success rate for people not wearing a mask is about 99.5%. [21]. However it cannot recognize those faces that have both masks and sun glasses.

As Russian cities go into lockdown to try to contain coronavirus, Moscow is using the latest technology to keep track of residents. City officials are using a giant network of tens of thousands of cameras - installed with facial recognition software - which they coupled with digital passes on people's mobile phones. A Moscow city official said on April 1st, that authorities had developed a smartphone app for infected residents to allow officials to monitor their movements. [22]

However, the main issue with this is that India does not have a well-defined surveillance system like China or Moscow. Building such a system would take a lot of time and money. Also, given the lockdown, it would be difficult to get workers to build the surveillance system. Hence this system is highly impractical. Also, not every Indian has a smartphone with location facilities that can be used to track them. People can also leave their phones at home, so that the police cannot track their movement.

2.3. Drones with cameras

Unmanned Aerial Vehicles (UAVs), commonly known as drones, are becoming vital tools in the fight against Covid-19 with law enforcement agencies using UAVs to monitor public gatherings, ensuring social distancing, spraying disinfectants over villages, overseeing cargo, etc. [3]

The Chinese government, which has long used technology to support its authoritarian regime, has been more ardent in its use of drones to enforce social distancing policies. The Chinese government has been using drones equipped with thermal sensors to find sick people walking around in public places, according to [this Wall Street Journal article](#) [8] from March 10. These government drones are now scanning the population to find people, potentially infected with COVID-19, who should not be out and about. Global Times News, a state-controlled news outlet, reported in January that police in parts of Taizhou, an eastern city of 6 million, has been using drones equipped with loudspeakers to deter people from congregating.

In other countries, like South Korea, drones are used to spray disinfectant over whole cities. In Avignon, France, National police conduct drone surveillance to see if people respect lockdown on March 31.

In some places like London, as reported by the New York Times, Britain's police force has been using drones to capture footage of people flouting the country's social distancing guidelines and then tweeting it out. [30]

This has also been used in different parts of India, like New Delhi and UP. Being a densely-populated state, UP has seen registration of over 15,000 FIRs in which nearly 47,000 persons have been named for violation of lockdown orders, officials said. Authorities said with the duration of lockdown all set to be extended, they are looking to put the drones to better use, particularly in hotspot zones, to minimise human interaction. [26]

Kerala, among the severely-affected states with Covid-19 cases, is using a variety of drones for monitoring and delivery of services. According to Kerala Police, they have deployed more than 500 drones across the state in association with the Drone Association of Kerala, since the beginning of the lockdown[28]. The state's police force posted to Twitter an edited video which compiled shots of people mostly in the villages running for cover as drones appeared above to check for those who were violating the lockdown over the Covid-19 epidemic. So far Kerala Police have filed nearly 2.5 lakh cases, made 25,125 arrests and seized 17,375 vehicles in all for flouting social distancing rules. They are also using a network of unmanned aerial vehicles in rural areas especially along the coasts where they cannot reach quick enough. Some of the drones are also fitted with police sirens, flashing lights and recorded messages warning people against going into public spaces without valid reasons.

It gives the advantage of vantage. One can also control the height of the drone from a distance, especially in crowded areas.

However, the main issue is maintenance. These drones can easily get damaged if not controlled properly. In many places, people against the lockdown rules are found to be throwing stones at these drones and damaging them. Another issue is cost. Deploying a large number of drones to monitor whole cities is very expensive. It also brings up the question of privacy, as the government can gain information of people's movement, and can use it for illegal purposes.

2.4. Current System

The current system is a combination of using drones for taking video footages of the people (or remote controlled cars), and RFID cards/tokens to track those citizens who leave with some valid reason. The RFID cards used are cheaper than the tracking wristbands. Also, remote controlled cars/auto driving cars, if used properly would only incur a one time cost. However, to monitor coastlines and places where there are no well-defined roads, drones would still have to be used.

3. System Architecture

Here, we propose a novel system which would be, a combination of the above-mentioned measures. Since a single system cannot work everywhere, the system proposed

is highly adaptable.

3.1. Users

There are two main types of users in this system

1. Citizens: the ordinary people who are supposed to stay at home, unless they have a proper reason to leave their homes: essential groceries, immediate healthcare, essential workers, etc.
2. Policemen/law officials: Who monitor the system to find those citizens who break the rules.

3.2. Main Workflow

1. First the citizen makes an account in the webapp, using his AADHAR number and photo/any other details.
2. The citizen's details are verified with the Government's database; After validation, an RFID card (permit card with a tracking chip) is delivered to the citizen. Care is taken that every person who registered with the right details get access to the card.
3. Each time the citizen would like to get out of their house, they would have to inform in the app, the reason for getting out and the time span for which they will stay out. These requests are looked into by the official, who then checks if the reason is valid or not, and then validates the reason and the time span. However, in case of an emergency (like a medical emergency), the citizen can mention that it is an emergency.
4. Once the citizen is out of the house, the law officials can track the person if necessary.
5. Through the different surveillance methods used (CCTV cameras, drones, satellite imaging etc.), the law officials can see video footages of different probable places of mass gathering, right from their houses.
6. If in case, the software detects an object in the footage (a moving person or a vehicle) that should not be out during quarantine, it applies various face recognition and object detection software, to be able to identify the person/the vehicle number.
7. In case the person is identified, and he possesses the card, and the person did inform a valid reason for him to be outside, then no action is taken. However, if the person is seen to be in a crowd of more than 4 people, an alert is sent.
8. If the person is identified, but he does not possess the card or any reason to be outside at that particular time, then an alert is sent to the police official, containing the person's name, his address, and the video footage over which he is found outside. If the person cannot be identified, then also, an alert is sent to the police.

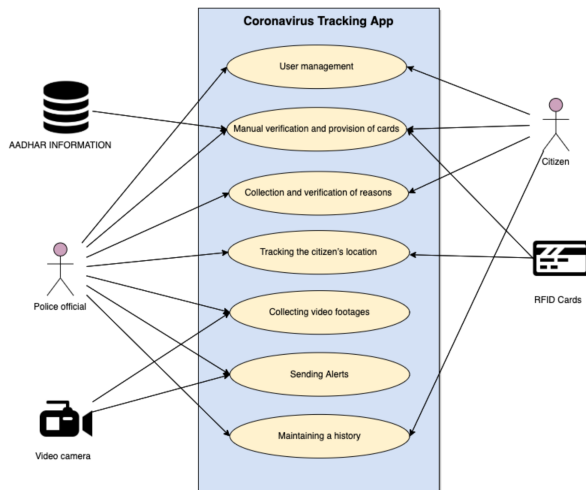


Figure 1. UML Use Case Diagram

9. Each alert is manually checked by the official to prevent any mishaps. In case the alert is valid, several different kinds of actions can be taken including but not limited to, imposing a heavy fine on the offender's account, the police arriving at the location to arrest the person and confiscate his vehicle. The person would also be forced to do a 28-day self-quarantine as a punishment. Repeated breaking of the law is dealt with, even more harshly, and can result in arresting the person, or making him wear non-removable wristbands (like those implemented in South Korea and Hong Kong) which would raise an alert if the wearer attempts to remove it, or tries to leave the house. All these instances would also be reflected on the citizen's side of the webapp: he can see the number of times he has been caught breaking the law etc.

3.3. Requirements

The various requirements of this application can be drawn in a Use Case Diagram as in figure 1 :

3.3.1 Functional requirements

1. **User management:** A safe and secure method to create accounts and authorize logins. There should also be a way to check the government database to ensure that the data provided is correct.
2. **Manual verification and provision of cards:** This would need a system for the official to look into each person's details and then verify them. This system would also include a delivery system so that the card is delivered to the person's house as soon as possible.
3. **Collection and verification of reasons:** This would require a form asking the citizen to enter the reason he would be leaving the house, and the time duration for which he is out. The official should also be able to see and validate this.
4. **Tracking the citizen's whereabouts:** This would require an RFID tracking system (to be discussed in detail below)
5. **Collecting video footages:** This would require CCTV cameras, drones, satellite imaging, etc. that are capable of face recognition and object identification.
6. **Sending Alerts:** There should be a system to send alerts in case any law breaking is found.
7. **Maintaining a history:** Each citizen can see the list of offenses he has done to the system, and the corresponding punishment he has received. This is also accessible to the law officials

3.3.2 Non-functional requirements

1. **Security:** The location data of the citizens should be secure; no outsider should be able to access any of the data (apart from the officials and the citizen himself)
2. **Privacy of the video footages taken:** Measures should be taken to ensure that none of the footages are used for malicious intentions (for example, posting videos of people on social media without their permission etc.)
3. **Measure to curb fake accounts:** Given such a large country, there should be measures to ensure that each account is made by a valid existing person. Manual verification of details and checking AADHAR number should be enough for ensuring that fake accounts do not exist.

3.4. Classes used

The different classes used are as described in figure 2

1. **User:** this represents a user with a username and password. A user can specialize into a police official or a citizen
2. **Police Official:** This represents the police official who is responsible for ensuring that the lockdown rules are being followed
3. **Citizen:** This represents each and every citizen of the country who is responsible for following the rules. They would be penalized, if they break the lockdown rules, by going out without permission

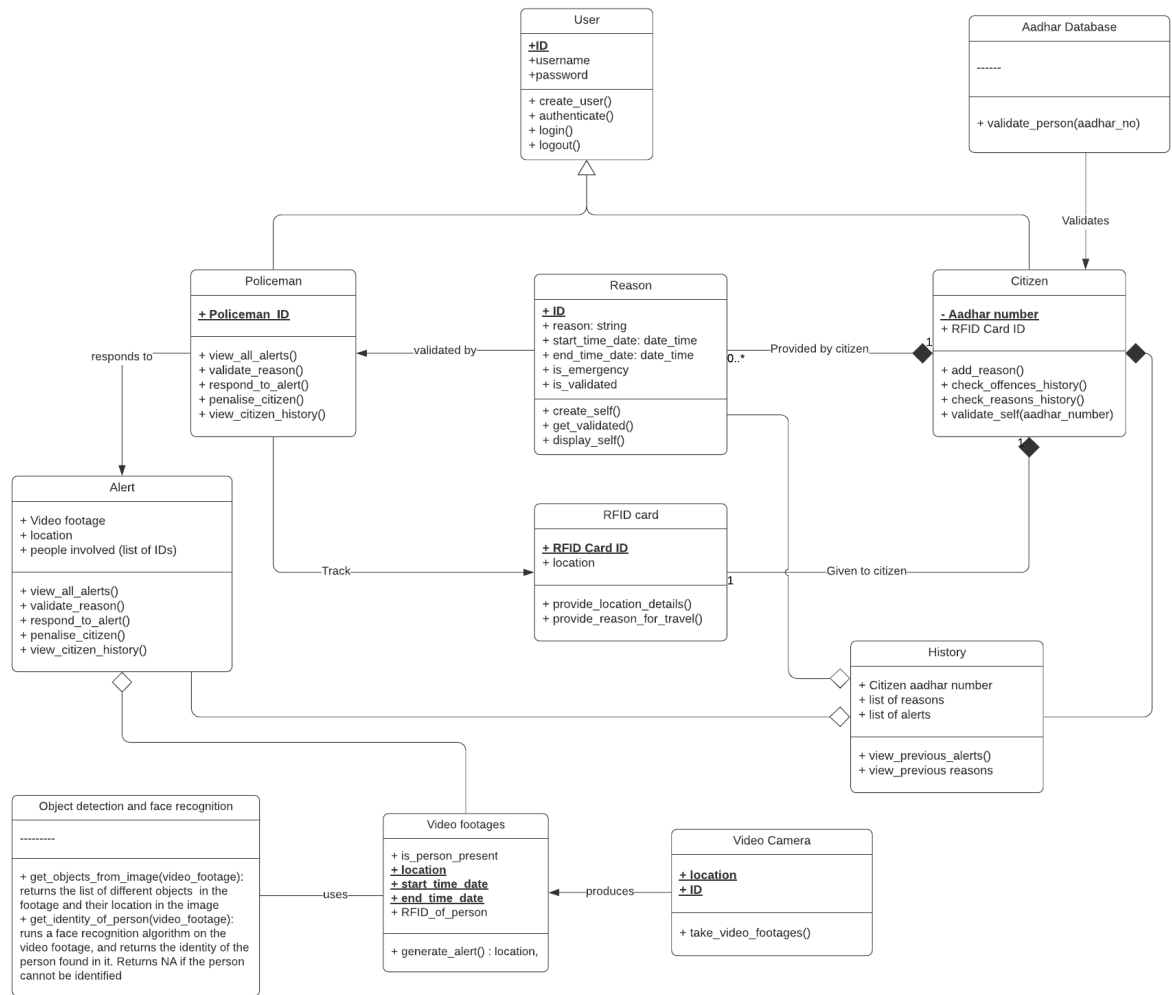


Figure 2. UML Class Diagram

4. **Aadhar information database:** This contains the Aadhar card information of every citizen of the country. This is used for verifying the details provided by the user.
5. **RFID cards:** Contain the RFID of the card. It can be tracked by the police official, and if tracked, would provide the details of its owner/bearer.
6. **Video camera:** this can be on a CCTV placed along the road or carried around by drones or robotic cars.
7. **Video footage:** this is produced by the video camera. One can use a face recognition and object recognition algorithm, to find any law breakers.
8. **Object detection and face recognition:** for the sake of this paper, this is considered as a black box with the

following functions:

- **get_objects_from_image(video_footage):** returns the list of different objects in the footage and their location in the image.
 - **get_identity_of_person(video_footage):** runs a face recognition algorithm on the video footage, and returns the identity of the person found in it. Returns NA if the person cannot be identified.
9. **Alert:** This contains the type of alert, the people/objects involved, the location of the video footage, and the footage itself. Each alert is checked manually, and action is taken by the police.
 10. **History:** This contains list of the citizen's previous alerts and reasons.

3.5. Modules explained

3.5.1 Tracking the citizen's whereabouts using RFID cards

Radio Frequency Identification (RFID) is the wireless non-contact use of radio frequency waves to transmit a unique ID between an asset that is tagged and a reader at a range that can reach up to 180 feet. This allows users to automatically and uniquely identify and track inventory and assets. RFID can provide accurate, real-time tracking data for fixed and mobile assets. [4]

By default, RFID tags are powered by incoming radio signals from the reader at distances from 3 to 15 feet, meaning they do not require any power. Without a battery that loses power over time, these passive tags can last virtually forever. The RFID component has two parts:

1. RFID reader that reads the tags. Here, these devices are either placed on the drone/robotic car.
2. RFID tags that is being tracked. Here, these are in the form of cards given to the citizens.

Some advantages of using RFID are as follows: [24]

1. Speed and Convenience
2. Durable and reusable tags
3. Does not require line of sight
4. Cheap, battery-free and washable

3.5.2 Collecting video footages

Using the existing CCTV surveillance network

Since the surveillance network is not as widespread in India, when compared to China [23]. Hence implementing such systems within a short notice is not practical. Building such a system would take a lot of time and money. Also, given the lockdown, it would be difficult to get workers to build the surveillance system. Hence for cities apart from New Delhi, that has comparatively a higher CCTV camera to population ratio, we need to move to drones or self-driving cars.

Using drones

As mentioned above, using drones have a large number of drawbacks: they are difficult to maintain and are costly. However, this is the best choice when it comes to taking video footages for the current system because of the following reasons:

1. Drones have the advantage of height. One can adjust the height of the drone so as to get a clear view of things, even in crowded or difficult to see areas.

2. Most of the drones can be controlled from a really far away distance: hence the police officials need not actually come to the streets for implementing lockdown.
3. Drones can be used to spray disinfectants over large areas, in case of a suspected infection hotspot
4. Drones can also be used to spread awareness among the people, by reciting the quarantine rules over and over again, as it moves around the city, and reprimanding anyone who broke the lockdown rules.

However, drones are fragile, when compared to CCTV cameras.

Using Self-Driving Cars

This brings us to the option of using self-driving cars, that patrol empty roads and take video footages of the roads and the surrounding areas. Self-driving cars rely on artificial intelligence to work. self-driving cars, use high-resolution cameras and lidar (light detection and ranging), a way of estimating distances to objects by bouncing light and sound off things. [32]. The concept followed while designing this system is mentioned in the research paper by Keenan Burnett, Andreas Schimpe et Al. 2020 [9]. This car would have the camera with high resolution that would take the video footages and also a RFID reader to detect those people possessing RFID cards.

3.5.3 Detecting people or objects in the video footages

Using YOLO object detection techniques

You only look once (YOLO) [7, 19] is a state-of-the-art, real-time object detection system. YOLOv3 is extremely fast and accurate. Here, A single neural network is applied to the full image. This network divides the image into regions and predicts bounding boxes and probabilities for each region. These bounding boxes are weighted by the predicted probabilities.

This model has several advantages over classifier-based systems:

1. It looks at the whole image at test time so its predictions are informed by global context in the image.
2. It is extremely fast when compared to other classifier-based systems.

Here, we use YOLO to detect the different objects in the images and see if there is any person/vehicle that should not have been in that location.

Using facenet to identify faces

FaceNet [5, 13] provides a unified embedding for face recognition, verification and clustering tasks. It maps each face image into a euclidean space such that the distances in that space correspond to face similarity, i.e. an image of

person A will be placed closer to all the other images of person A as compared to images of any other person present in the dataset. The main difference between FaceNet and other techniques is that it learns the mapping from the images and creates embeddings rather than using any bottleneck layer for recognition or verification tasks. Once the embeddings are created all the other tasks like verification, recognition etc. can be performed using standard techniques of that particular domain, using these newly generated embeddings as the feature vector.

However, given that many people wear masks given the pandemic, face recognition algorithms that work even when the masks are used. In order to effectively prevent the spread of COVID19 virus, almost everyone wears a mask during coronavirus epidemic. This almost makes conventional facial recognition technology ineffective in many cases. Hence we use the system proposed by Zhongyuan Wang, Guangcheng Wang, et Al.(2020) [35] This system is designed based on deep learning, which depend on a large number of face samples: both masked and unmasked.

Here, if by using YOLO, we detect a person, we run facenet to identify the person's face, from the database of faces (given by the government).

Vehicle number plate identification using OCR

Optical Character Recognition (OCR) is widely used technology which converts scanned images of printed text, handwritten text characters into machine encoded text information such as ASCII. Here, we use the system proposed by Prashant Jadhav, Pratiksha Kelkar, et Al(2016) [17]. Automatic number plate recognition has three major parts: vehicle number plate extraction, character segmentation and Optical Character Recognition (OCR). Number plate extraction is that stage where vehicle number plate is detected. The detected number plate is pre-processed to remove the noise and then the result is passed to the segmentation part to segment the individually characters from the extracted number plate. The segmented characters are normalized and passed to an OCR algorithm. At last the optical character information will be converted into encoded text. The characters are recognized using Template matching. The final output must be in the form of string of characters.

Here, if by using YOLO, we detect a vehicle, we run OCR on the vehicle's number plate to identify the vehicle and its owner from the database.

3.6. Sequence Diagrams

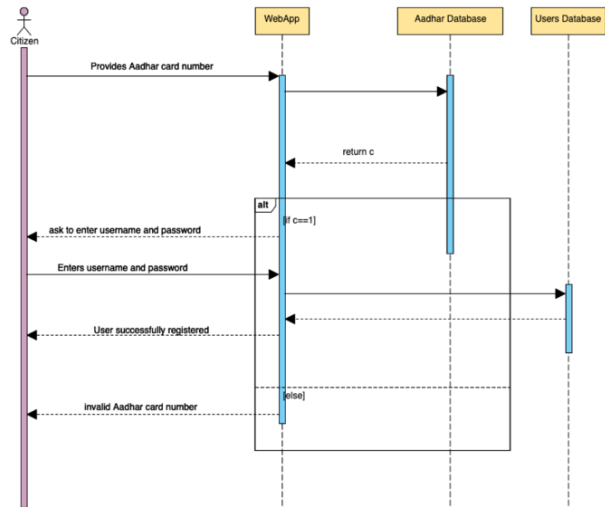


Figure 3. Sequence Diagram for Verification and Registration of a Citizen

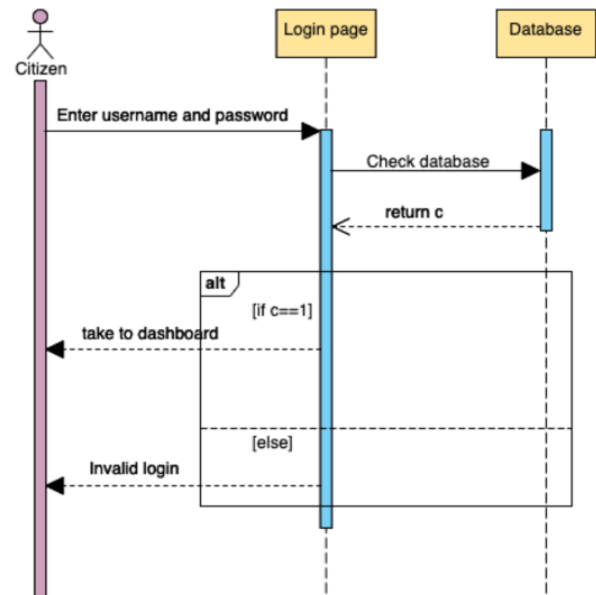


Figure 4. Sequence Diagram for Session Authentication (user login)

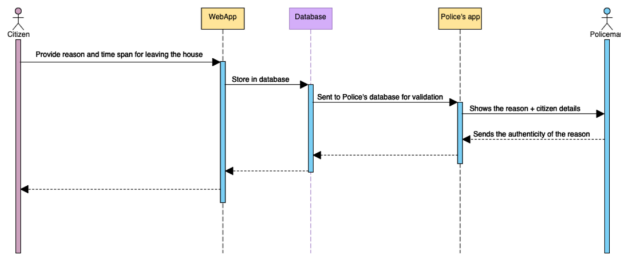


Figure 5. Sequence Diagram for Reason submission. Here the citizen provides the reason along with the time span of staying out of the house. The police official verifies the information.

3.7. State Diagram

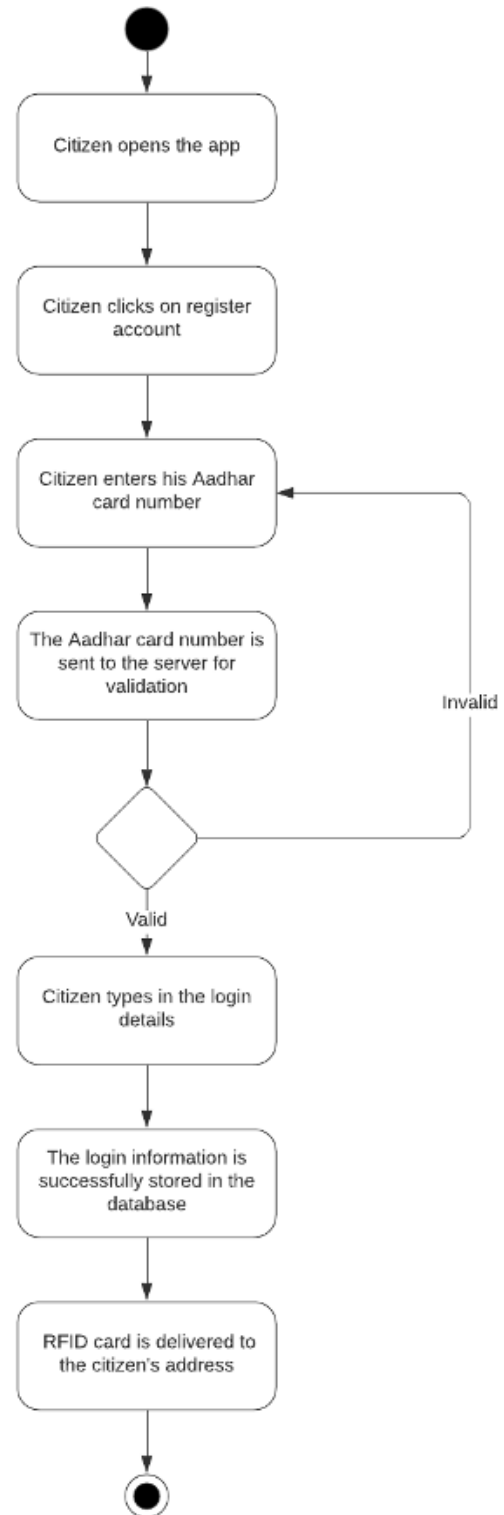


Figure 6. State Diagram for Citizen verification and registration.

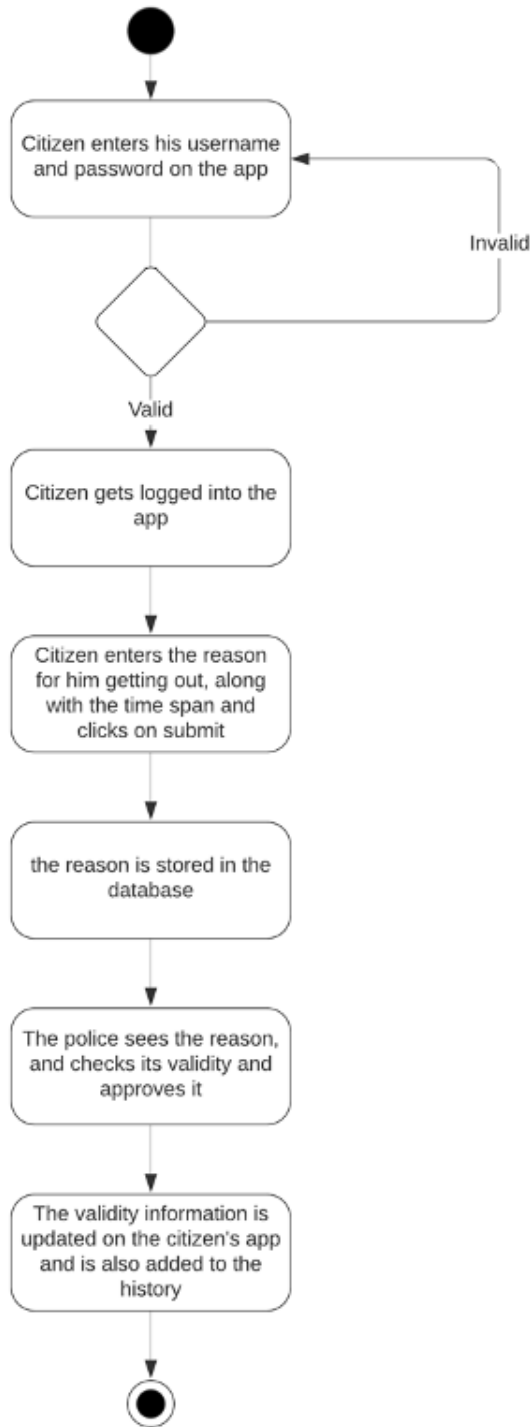


Figure 7. State Diagram for the citizen login and then submitting a reason.

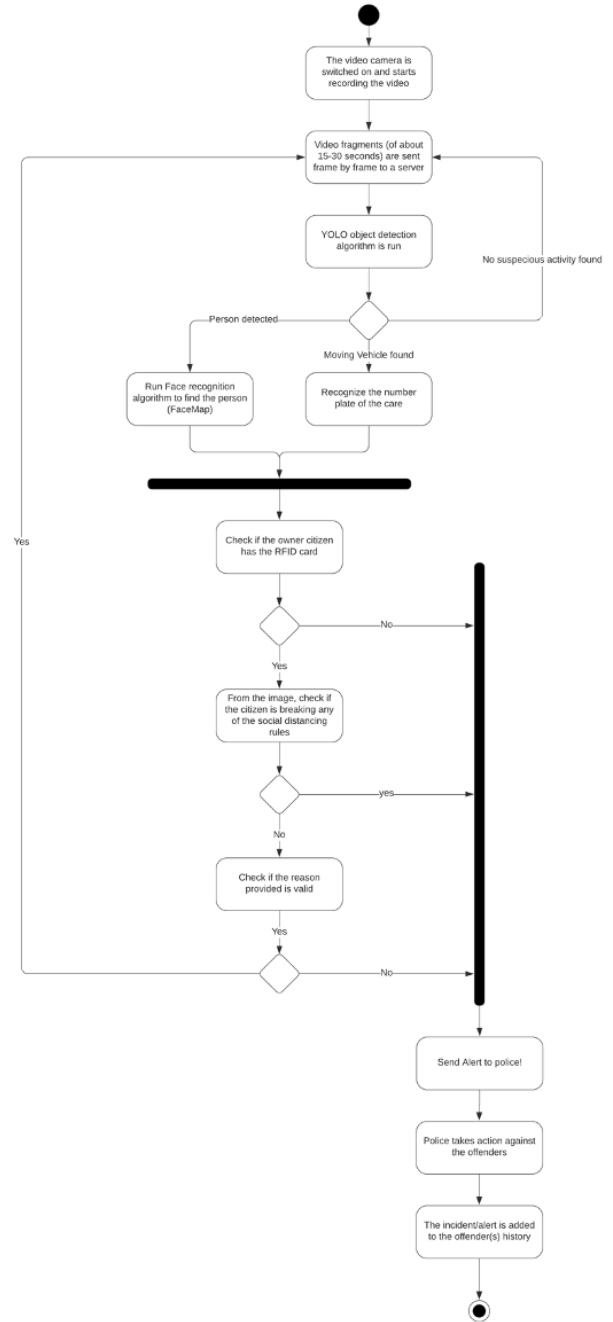


Figure 8. State diagram for a police getting an alert and then acting upon the alert.

4. Conclusion and Future Work

In this paper, we have successfully proposed a novel software system, that uses remotely controlled drones and robotic cars, to patrol the roads and collect videos, from which, people and vehicles are identified. If the person is found breaking the lockdown rules without any reason, then

the police can track his position (either by using the RFID card, or by the video footages) and then arrest/fine him.

This solution is highly adaptable in the sense that, if a better image detection software is found, then that can be used in the corresponding module in the system. This is true for all the other modules used in the program.

The main issue of the above solution is the breach of privacy. The threats like data leakage, privacy violation etc. , originating from careless use of facial recognition systems are pretty real, and hence proper measures should be taken to avoid them. The world is sleepwalking into a surveillance state during the coronavirus pandemic, with many companies like Google and Apple sharing the location data of their users to their countries, so as to track their every move. Using surveillance planes and satellite imaging to identify gathering of people and their identity has led to multiple concerns that such pervasive monitoring could violate people's rights. If the surveillance data lands in wrong hands, then there is a huge chance of Surveillance abuse, which is the use of surveillance methods or technology to monitor the activity of an individual or group of individuals in a way which violates the social norms or laws of a society. [11]

Maintaining a steady state of low-level or no transmission is important because, as the pandemic spreads, its public health and socioeconomic impacts have been profound, and have disproportionately affected the vulnerable. Many populations have already experienced a lack of access to routine essential health services. Every action taken now to slow the transmission of COVID-19 is an action that brings forward the day that these services can return. (WHO-covid-strategy-update, 14 April 2020). This further aggravates the need to get over with the spread of the virus as soon as possible, and with the least number of fatalities.

Imposing the lockdown is the way to go, and by using technology to impose the lockdown rules, one can eliminate the need for the policemen to go directly on the roads and be at the risk of getting infected themselves. This would help to stop the spread of the virus completely, leading to a safe world.

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